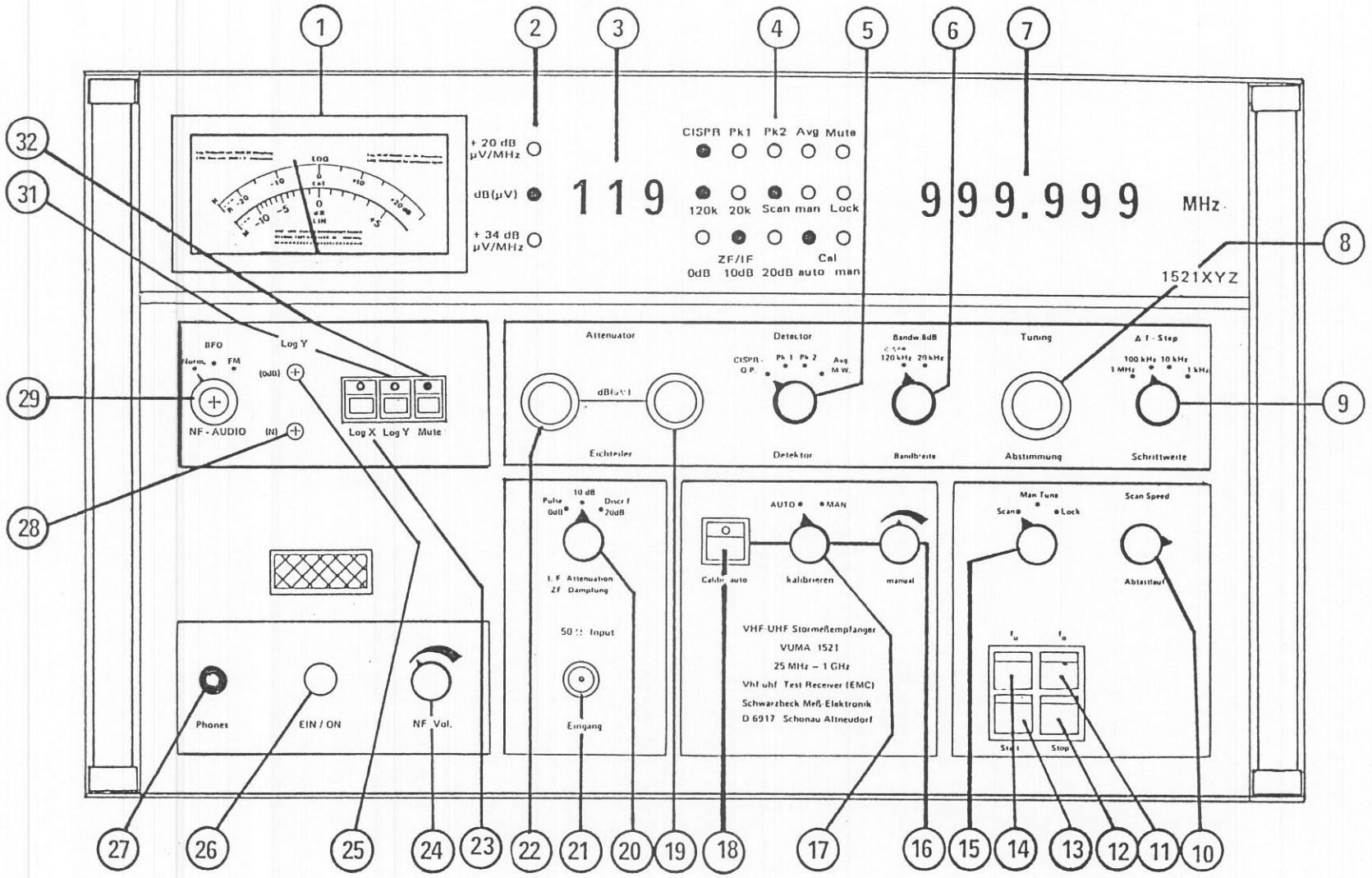
VUMA 1521 BEDIENELEMENTE OPERATING CONTROLS



V H F - U H F - E M I - TEST RECEIVER V U M A 1 5 2 1 OPERATING CONTROLS, CONNECTORS, Short Instruction

(1) Analog Meter for dB-Level-Display, upper scale: LOG.Voltage display, *(nearly linear dB scale covering more than 40 dB useful level range)* lower scale: LIN. Voltage display (dB expanded at high level), high resolution, high accuracy, −10dB...0dB...+6dB ref. to 1 μV.

(2) LED Indicators for dimension (dBμV, dBμV/MHz, bandwidth factor)

(3) Display of Attenuator Setting *(dBμV Display if meter indicates zero dB)*

(4) LED Check of Receiver Function *(Check Pattern may be used to avoid erroneous settings of detectors, bandwidth, calibration mode etc.)*

(5) Detector Function Switch to select Quasi-Peak, Peak 1 & 2, Average Det.

(6) Bandwidth Selector Switch *(CISPR Standard Bandwidth: 120 kHz)*

(7) Frequency Display (MHz), 6 digits (Receive Frequency)

(8) Manual Frequency Tuning, step size 1k, 10k, 100k and 1 MHz(see -9-)

(9) Frequency Tuning Step Width, both for manual and scan tuning

(10) Analog Control of Frequency Scan Speed for automatic tuning(slow/fast)

(11) Key to set highest frequency (f_o= 999.999 MHz),switch (15) to "scan".

(12) Key to stop frequency scan immediately (switch -15- in scan position)

(13) Key to start SCAN (if switch -15- is in scan position)

(14) Key to set lowest frequency (f_u= 25 MHz) if switch (15) is in scan pos. *(key 11 and 14 are mainly used alternately to set controls of XY-Recorder)*

(15) Switch for selecting mode of tuning: Scan, Manual Tuning, Lock.

(16) Calibration / Amplification Control for m a n u a l calibration (17 on "man.")

(17) AUTO / MANUAL Calibration Selection Switch (normal setting: AUTO)

(18) Key for semi automatic calibration (any short time of pressing is sufficient) *(Press continuously for XY recorder cal. and for setting 0dB LOG control -25-)* ALSO SEE DETAILED DESCRIPTION of all CONTROLS

(19) 1 dB Step Attenuator (R.-F. Input Att.) *(Substitution Measurement w.high accuracy)*

(20) Intermediate Frequency Attenuator Switch, 0dB, 10dB, 20 dB *(use 10dB as starting position; for low p.r.f.pulses use 0dB, for sine wave 20dB, influences the noise floor and the pulse linearity range, see detailed instruction)*

(21) VHF-UHF Input Connector (type N female, 50 ohm), max. 1 V rms dc/ac/rf)

(22) 10 dB Step Attenuator Setting, display on (3), i.-f.switch (20) added into display *(This is the main input r.-f. attenuator, set to 30, 40, 50, or 60 dB to start).*

(23) Key to select a LIN. or LOG. dc output voltage for frequency on an XY Recorder *(This dc voltage rises with frequency in a LIN or LOG function for different graph patterns on the XY recorder; many different samples are provided)*. LED on: LOG

(24) Audio volume control *(Audio Monitoring may be very important to check origin of noise)*

(25) Preset Control to adjust meter deflection to center scale 0dB position in LOG.voltage mode *(adjust ZERO Control -28-, designated "N" at first with low noise in i.-f.switch position "20dB i.-f. Attenuation", switch (20), then this control (25) to 0 dB on meter).*

(26) Power Switch (Mains) ON/OFF, press to operate.

(27) Jack for head set (ear phones) to check signal noise for origin. (EuT or ambient etc).

(28) ZERO preset control for LOG meter range (upper scale), adjust with no signal and lowest noise (i.-f. attenuator switch -20- set to "20 dB"), until meter deflects to "N" or "M" at the left-hand start of the scales. Check or adjust "0dB" control (25) with pulse calibration signal by continuously pressing key (18).

(29) Audio Demodulator Switch ("normal" is for AM Detection, BFO switches heterodyne oscillator on, and "FM" permits FM demodulation, wide or narrow (BW switch 6)

(30) n.a

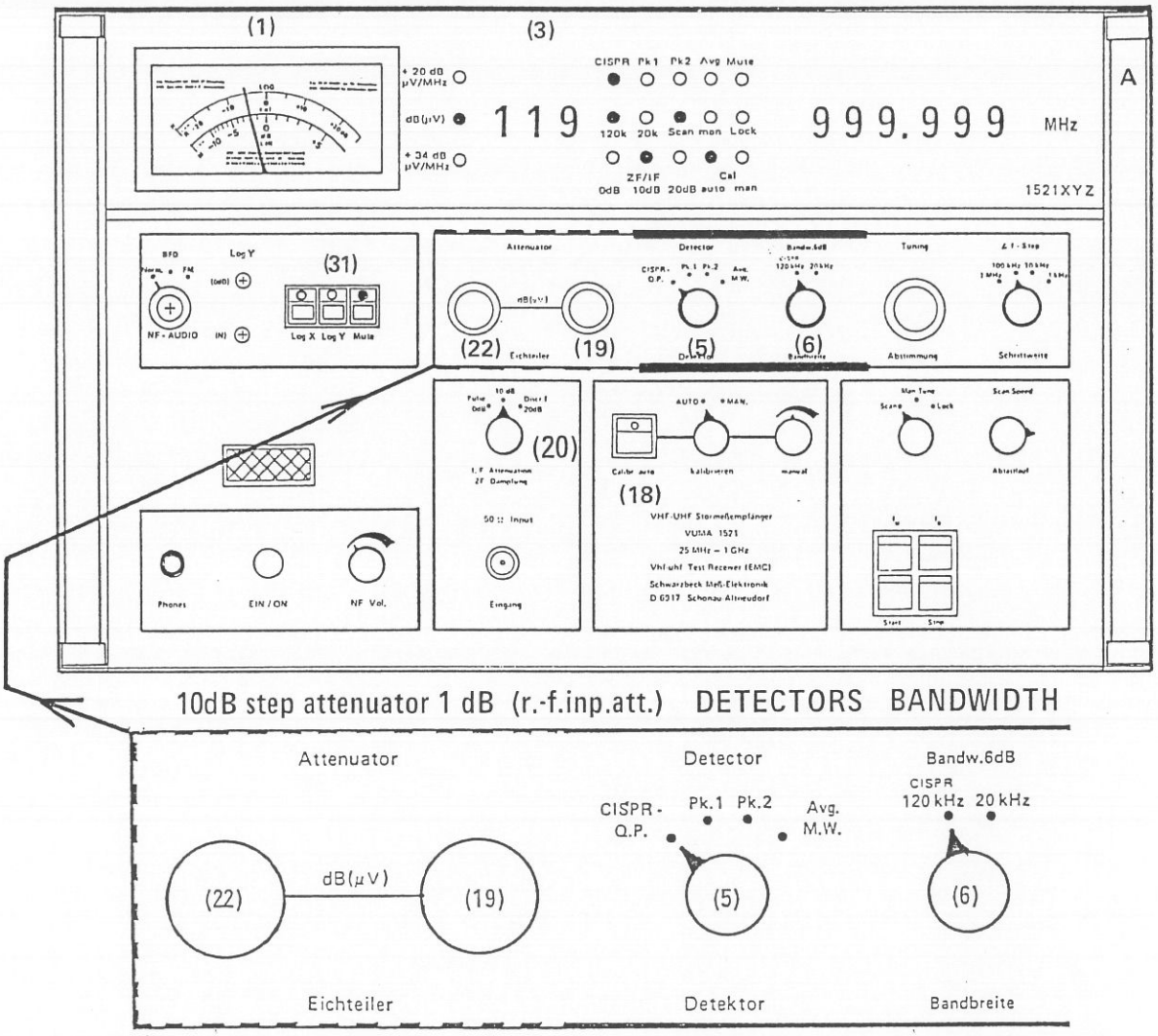
(31) Key to switch LOG or LIN Level Display on meter and XY-Recorder (LED ON: LOG.)

(32) Key to activate the "MUTE" Position (stps scan at 50 and every 100MHz to avoid clicks).

CONDENSED OPERATING INSTRUCTIONS (also read detailed information)

Connect Receiver VUMA 1521 to AC Power (Mains) after having checked the voltage setting on the rear of the unit. The power cable provides safety ground to the conductive parts of this unit if the mains power outlet provides PROTECTION EARTH Ground. Turn on with Power Switch (26). If the calibration selector switch (17) is set to "AUTO", the receiver provides an automatic level calibration after one second. During this pulse calibration, the LED in key (18) lights up, and a buzzing noise of 100 Hz is heard in the speaker for a short period. For later level calibration, press key (18) for a short time (semi-automatic calibration). Connect a signal source to the input connector (21).
Start with a 10dB or 20 dB setting of the i.-f. attenuator (20) and 30dB on the 10-dB step attenuator (22). With an antenna connected to the input (21), radio signals will be heard (unless operated in a screened room), if the receiver is tuned through the frequencies from 25 MHz to 1 GHz. Fast tuning is accomplished with 1 MHz steps on switch (9) in either manual or scan tuning (switch -15-). Near to the frequency of interest, reduce step size to 100 kHz or 10 kHz or for small bandwidth (switch 6) to the smallest step size 1 kHz.
To measure signal levels, use either LIN or LOG meter display (key 31) and set the r.-f. 10dB step attenuator (22) to have a convenient meter deflection.
For level recording of a vhf-uhf spectrum, connect an XY recorder to the 25 pin D connector at the rear with the cable supplied. Set switch (15) to "SCAN", switch (9) to 10 (or 100) kHz steps, adjust "Scan Speed" control (10) as desired, select linear or logarithmic frequency (X) output voltage (key23) depending on recorder paper frequency scale, check the corner frequencies 25 MHz and 1 GHz with keys (14) and (11), adjust recorder with zero control at 25 MHz and variable amplif.control at 1 GHz, adjust 0dB level and voltage zero according to detailed description. Start scan with key (13). With a proper XY recorder, the pen shifts down on start and is lifted at end of scan.

FOCUS on RF ATTENUATORS (10dB/1dB), DETECTORS, BANDWIDTH



R.-F. STEP ATTENUATORS

(22) The 10 dB Step Attenuator is set to the lowest attenuation if weak signals are expected. In case weak and strong signals are found, use the LOG Meter function for upper scale with more than 40dB of useful meter range. The sum of the r.-f.attenuator (10dB and 1dB) and the intermediate frequency (i.-f.) attenuator (switch 20) is displayed on the red 7-segment level display (3) in dBµV (0 dBuV = 1 uV, 20dBuV = 10uV, 40dBuV = 100 uV, 60dBuV = 1 mV etc., the lowest attenuator setting, however, is 10 dBuV (=3uV), and 0dBuV can be read on the meter (1) at the −10dB position. For higher resolution and accuracy, use the LIN meter range (key 31 off) and read lower meter scale (−10 ... 0 ...+6 dB).

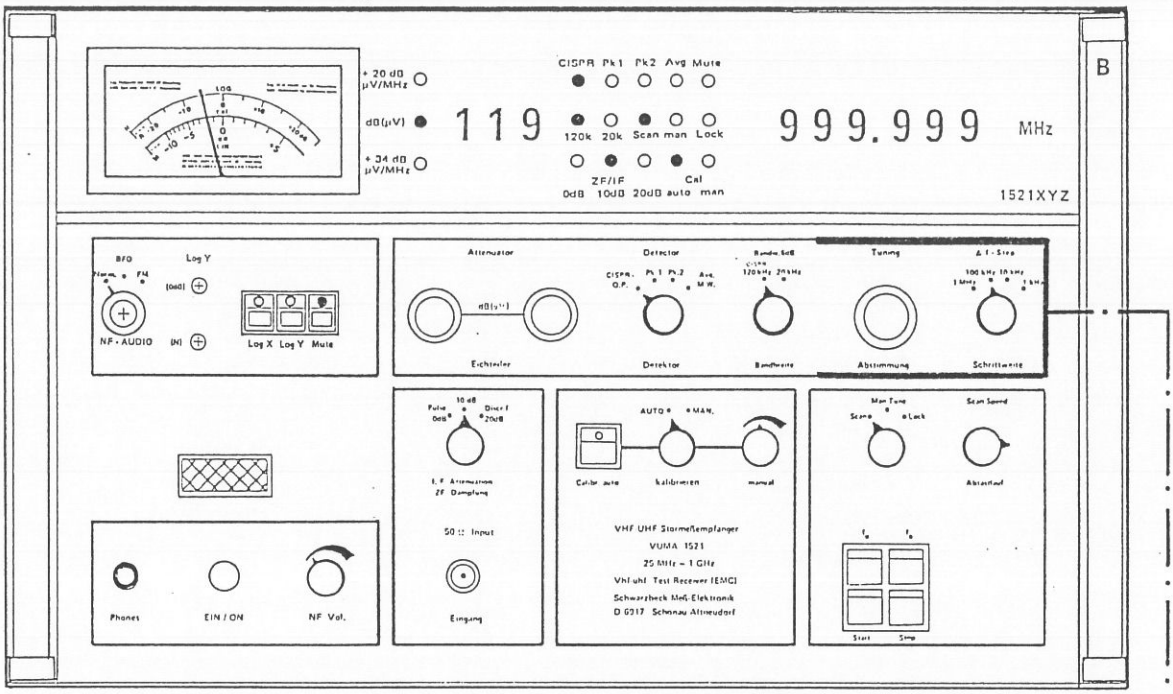
(21) The 1 dB Step Attenuator will in most cases remain in the 0dB position, especially if the LOG voltage meter range (upper scale) is used. For highest accuracy, however, a full attenuator substitution measurement is possible: Set the 10dB- and the 1dB step attenuators until the meter deflection is near the center scale 0dB mark. If the calibration (key 18) is accomplished, the accuracy only depends on the precision of the calibration source and the accuracy of the attenuators. Add or subtract fractional dB if the meter pointer settles to the right-hand or left-hand side of the 0dB meter mark.

Generally, add meter reading and LED Level display (3) for the final rf voltage in dBuV. With an XY Recorder, the rf (EMI-) voltage is directly read from the level pattern.

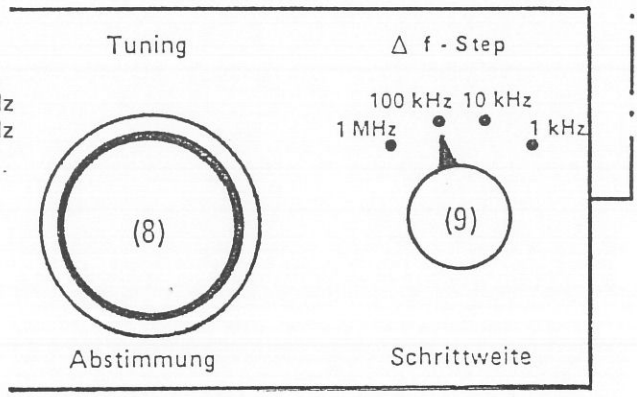
DETECTOR FUNCTION and BANDWIDTH :

(5) Several detector functions are available that provide the same voltage reading with unmodulated sine wave signals, but give different readings with AM signals and possibly enormous differences with pulses, especially low pulse rates.
The first position of switch (5) is the CISPR / VDE Quasi-Peak Detector with a pulse frequency weighting function. The meter indication is proportional to the "annoyance" caused by pulse interference. With 10 Hz p.r.f. the reading is 14 dB lower, with 1 Hz 28.5dB lower than 100 Hz.
The 2nd and 3rd switch position provides "true peak reading" irrespective of p.r.f. (MIL Standard). In the 2nd position (Pk1), the dumb time is small (0.2 sec.), Pk 2 has a longer hold time (2 sec.)
The last switch position is the AVERAGE responding detector with almost no sensitivity to pulses; it is ideal to "select" sine wave signals out of a mixture. Normal Bandw. is 120 kHz (see Op.Instr.)

FOCUS on FREQUENCY TUNING, manual and automatic scan, step-w.



MANUAL TUNING FREQU. STEPs



(8) This is the manual tuning control
It is an optical encoder that steps the frequency synthesizer in small increments of 1 kHz (quasi-continuous tuning), 10 kHz (preferred for automatic scanning), 100 kHz and 1 MHz.

This 1 MHz position is used for quick manual tuning or scanning (full range from 25 MHz to 1 GHz within 5 seconds, if analog scan speed control (10) is at maximum and no muting (key 32) is used.

(9) Switch for frequency increments, both for manual and scan tuning.

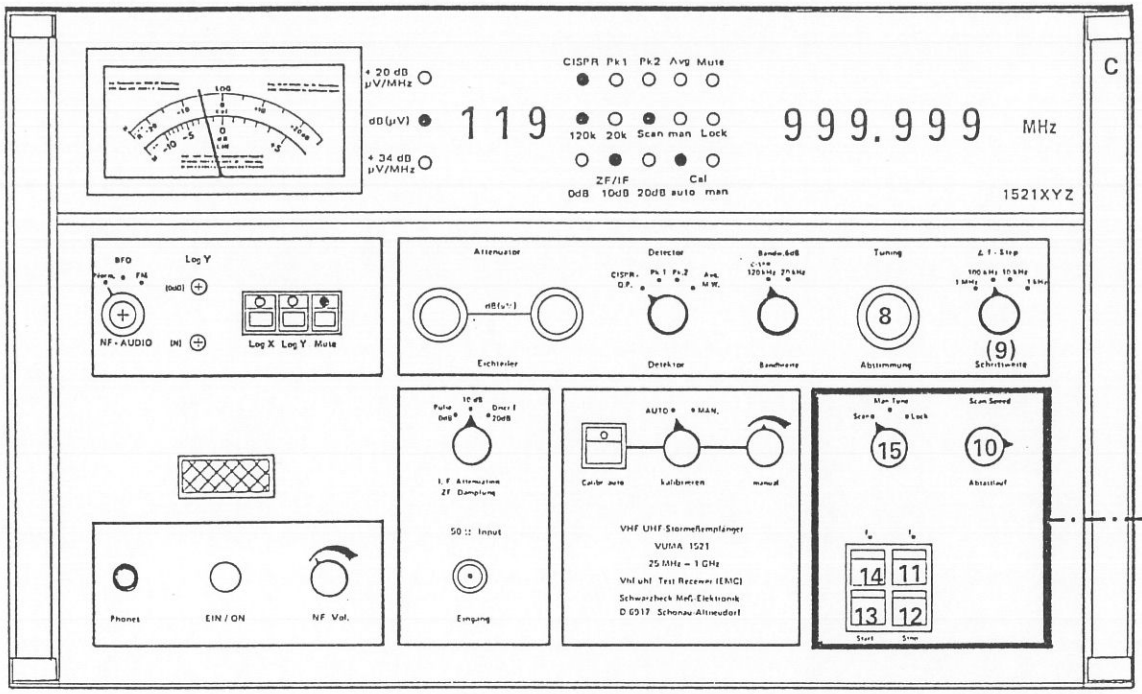
The selection of the proper tuning speed depends on the type of noise spectrum, bandwidth and detector function (and their time constants). More on this subject is explained in the detailed operating instructions.

To tune a specific frequency quickly, use the 1 MHz step width on switch (9). If this frequency is in the lower half of the total coverage, press the key for setting the lowest frequency 25 MHz (key 14, f_U) in position "SCAN" of switch (15), then press "START" key (13) and, after reaching the desired frequency, the "STOP" key (12). Or, for manual fast tuning, place switch (15) into the center position "MAN. TUNE" and set frequency with Tuning knob (8). If precise fine tuning is desired, finally switch to 100, 10 or 1 kHz increments (9). The 3rd position "LOCK" of switch (15) is used to avoid incidental touch of the tuning knob with loss of frequency setting.

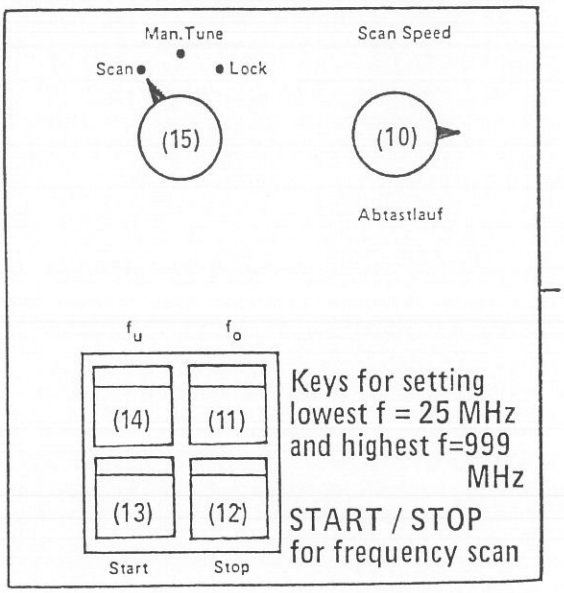
The Tuning Knob (8) provides 32 steps per revolution. This means a frequency change of 32 MHz /turn in the 1 MHz position of switch (9), 3.2 MHz with 100 kHz increments, 320 kHz with 10 kHz and 32 kHz per turn with the 1 kHz increment setting.

For the automatic frequency scan, especially with XY recording, certain considerations concerning the scan speed have to be observed to permit the voltage levels at the detector to settle according to their time constants. Filter settling time is very low because specialized filter curves are used in this receiver. For fast tuning with mainly narrow-band (sine wave) signals, the PEAK DETECTOR (Pk 1 with short, Pk2 with long discharge time) must be used. Its attack time is in the microsecond region, and a detected voltage is stored for the meter or recorder to reach the proper deflection.(More on this subject: see XY recording).

FOCUS on CORNER FREQUENCY SETTING, SCAN START/STOP, TUNING



Selection of man.tune or scan, Scan Speed



(15) Switch with 3 positions:
"Scan": Automatic frequency scan by pressing the Start key (13), stop scan with key (12).

"Man. Tune" is used for manual tuning with large knob (8) with increments set with "Δf step" (9).

The "Lock" position decouples the synthesizer tuning from external controls to save a frequency setting.

(10) "Scan Speed", analog speed control, use together with step size control (9).

(14) and (11) set the receive frequency to the lowest frequency (f_u = 25 MHz) or to the highest frequency (f_o = 1 GHz) to adjust XY Recorder start and stop position. Switch (15) must be in "Scan" position.

(13) and (12) are keys for starting and stopping a scan, they are also effective in position "Scan" of (15).

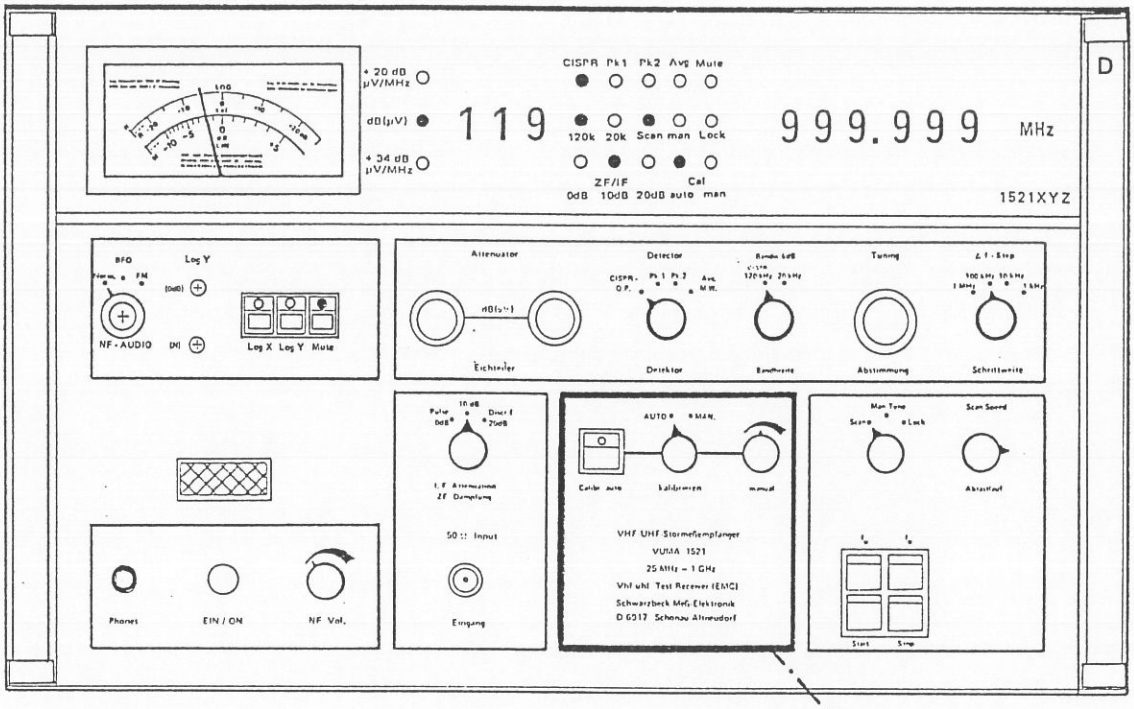
MANUAL TUNING:

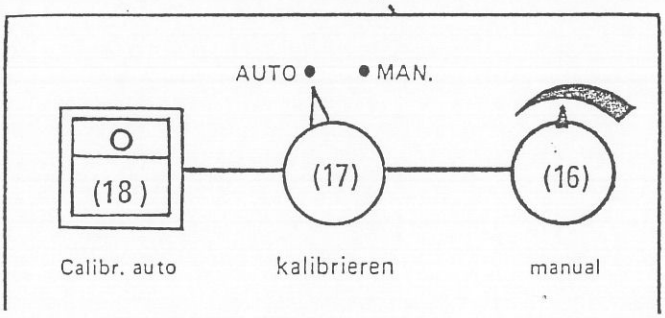
Set switch (15) to the mid position "Man. Tune" and select steps at switch (9) for fast tuning (1 MHz) or for medium progress (100 kHz, 10 kHz) or for fine tuning (1 kHz).

FREQUENCY SCAN, automatic tuning :

Set switch (15) to the first position "Scan" and select frequency steps of 1 MHz /100k / 10k or 1kHz at switch (9), depending on speed and bandwidth (see detailed operating instructions).
Press key (14) to set start frequency to 25 MHz (or manually tune in a desired higher frequency to start with). Use the analog scan speed control (10) for a range of extremely slow tuning (CCW setting, 1 kHz steps) up to extremely fast scanning (CW setting of -10- and 1MHz steps, Use key (12) to stop scanning immediately. Use "Lock" position of switch (15) to keep a fixed frequency.

FOCUS on PULSE CALIBRATION of LEVEL, Automatic, Semi-Automatic, manual





Key (18) is used for semi-automatic receiver calibration. In position "AUTO" of switch (17), shortly press key (18) for level calibration.

In the same switch position, there is a fully automatic calibration one second after turn-on (power ON).

In position "MAN." of switch (17), a manual calibration is possible with Control (16)

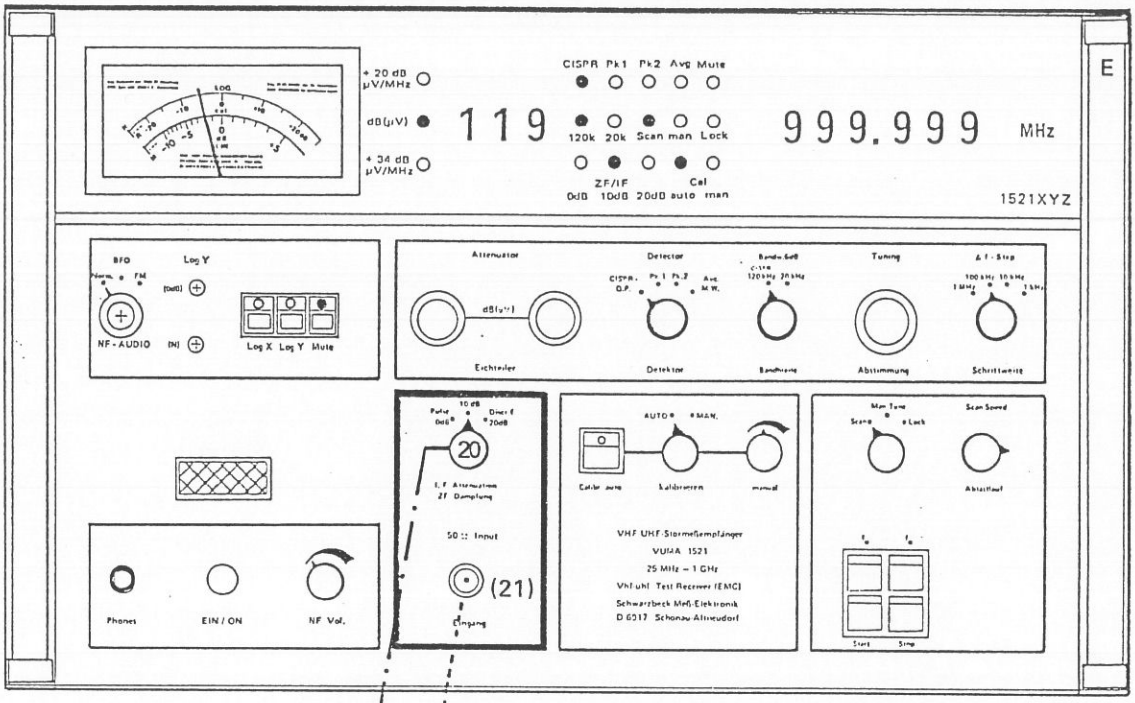
LEVEL CALIBRATION

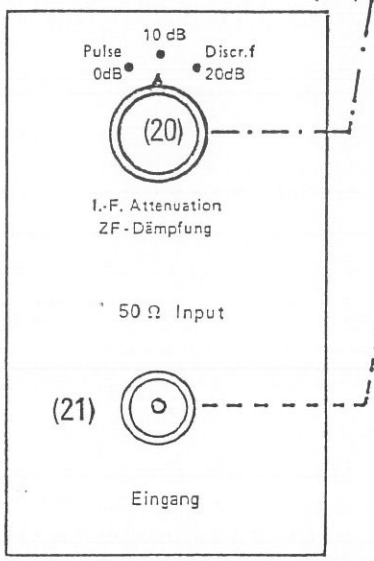
Being a genuine EMI Receiver that correctly measures pulses, it is one of the attractive ways to use very short pulses at 100 Hz p.r.f and 200 Pico second duration to provide a calibrating signal of the same spectral intensity at any frequency within the frequency range of 25 MHz to 1 GHz.
(Another method would be SINE WAVE CALIBRATION with the 110 dBuV output signal of the Tracking Generator model MG 1522).

With this internal pulse calibration, the attenuator setting, detector function and other control settings are of no importance, as the logic circuits of this receiver always switch to the QP Detector and bypass the attenuators, both 1dB and 10dB steps on the r.-f. side and the i.-f. attenuator. So quick and dependable level calibration is possible. After warm-up, the calibration key (18) may be pressed from time to time for recalibration. A quick fractional-second key-stroke is sufficient. For adjusting the voltage (dBuV) variable amplification of an XY recorder, press key (18) as long as required to set the recorder control to the calibration line (0 dB relative, box on the left-hand scale of the recording paper). In almost every case, this semi-automatic calibration will be perfect. A first automatic calibration without pressing the key is accomplished one second after mains power turn-on.

Only in a few cases it might be desirable, instead of calibrating to the center scale 0dB mark on the meter with the AUTO CAL function, to set the calibration signal (100 Hz pulses) to some other spot on the meter scale, (e.g. to the +5dB mark to increase sensitivity by 5dB).In this case switch to "MAN." and adjust control (16) to bring the pointer to the desired scale mark. During this time the key (18) must be pressed continuously for the calibration process.

FOCUS on INTERMEDIATE FREQUENCY ATTENUATOR and INPUT N-Connector





(20) SELECTOR SWITCH for I.-F. ATTENUATOR

The proper use of the optimum intermediate-frequency attenuation together with the proper r.-f. (input) attenuation is of great importance.

For EMI Pulse Measurement a high input (r.-f.) attenuation is necessary to reduce the risk of pulse overload. To be sensitive the i.-f. attenuator switch (20) **m u s t** be set to 0 dB. The label "Pulse" reminds the user to set this switch to the 1st position "0dB Pulse".

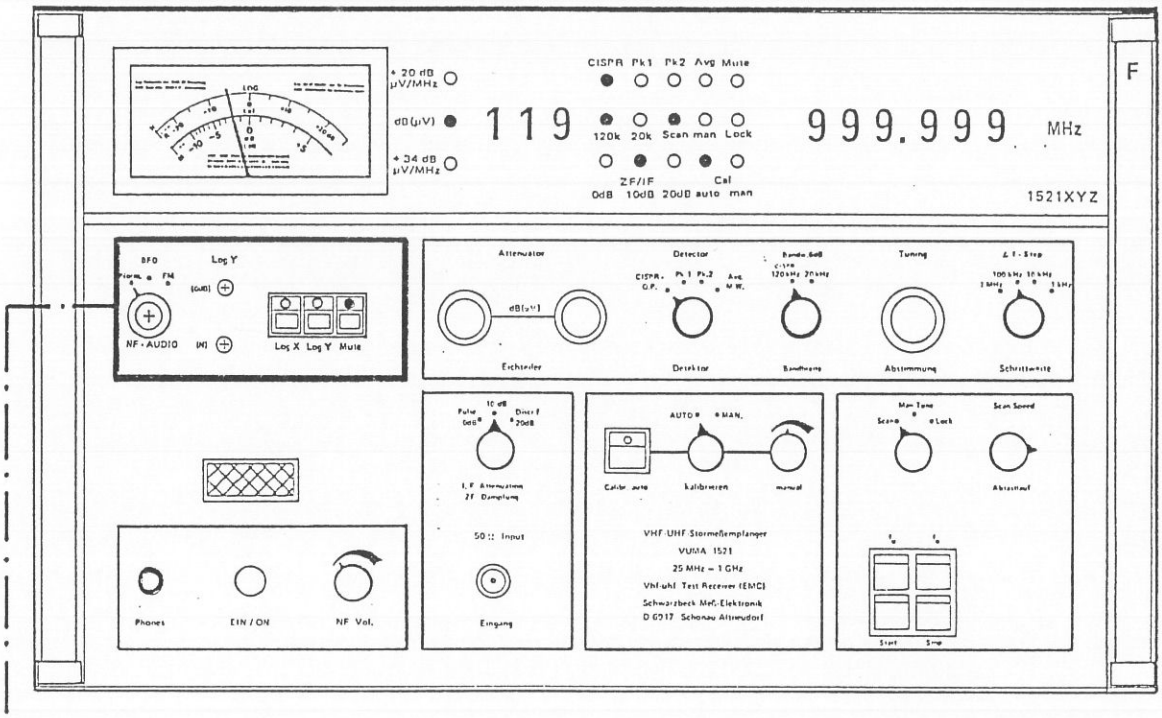
On the other hand, there is a lot of unused dynamic range when sine wave signals are measured, for example the harmonic spectrum of a clock oscillator. In this case, little noise floor is desirable, so a high setting (20dB) of the i.-f. attenuator is preferred (3rd position:"Discr.f.")

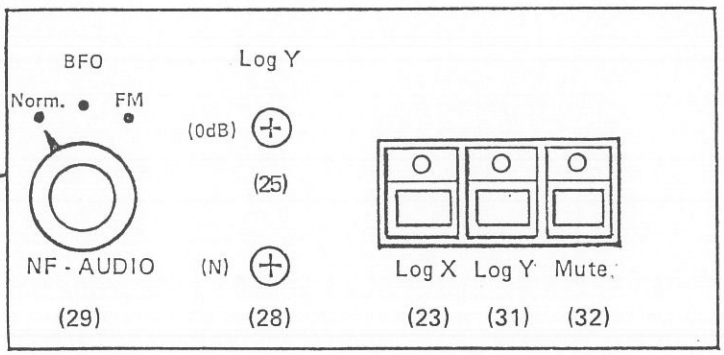
As a starting position set switch (20) to "10dB" i.-f.attenuation. If only narrow-band signals are found and 30 dBuV sensitivity is sufficient, the switch (20) may be set to "20dB" for reduced noise display. If the EMI noise contains pulses of low p.r.f. or if single clicks are to be measured correctly, use the 1st switch position "Pulse, 0dB". In this case the noise floor will be displayed, particularly on the lowest r.-f. (input) attenuator setting and in the LOG Voltage Level mode. Among all known true EMI receivers, this is the model with the highest sensitivity, even in Quasi Peak and 120 kHz BW the normal noise floor is around –5dBuV (+5 to 10 dBuV in other receivers, untuned / non-selective pre-amplifiers may not be used with low p.r.f. pulses). This VUMA 1521 does not use broad-band preamplifiers.

INPUT N-CONNECTOR CAUTION: Max. dc/ac/rf input voltage: 1V rms (max.3 V,10sec)

This 50 ohm input is equipped with a female N receptacle. The input impedance is very accurately 50 ohm in the higher attenuator settings (22 & 18), starting with the second position of the 10dB steps (the displayed attenuation also contains the setting of the i.-f.attenuator -20-).
With 50 ohm sources the accuracy in the lowest (most sensitive attenuator-) position will be almost the same as with higher settings. If a source (e.g. broad band antenna, MDS Clamp) is far off 50 ohms source impedance, the mismatch attenuation due to both VSWR's might be slightly higher. In this case an external fixed attenuator of 3dB, 6dB or 10dB may be used. Add the external attenuation to the reading.

FOCUS on AUDIO MODE SWITCH, LIN/LOG KEYs for X and Y (Voltage),controls





(29) Switch for AUDIO reproduction, "Norm." is for AM Detection, "BFO" (beat-frequ.oscillator) heterodynes signals for identification, FM demodulates wide and narrow band FM

(23) Key to switch X output voltage for frequency axis of XY Recorder from LIN to LOG Scale (depends on Recording Paper).

When LED in key (23) is ON, the X output is in a logarithmic relation to frequency, if pressed once more (LED OUT), the X output is linear with frequency.

(31) This key is responsible for LOG voltage output for the XY Recorder, and the meter (1) is read on the upper scale with more than 40 dB useable range (LED ON). If pressed once more (LED OFF), the output voltage to the recorder is linear with the r.-f.input voltage (recording paper from −10dB ... 0dB ... +6dB), and the l o w e r meter scale is used (high resolution for dB level, highest accuracy).

(32) is a "MUTE Key". If pressed (LED ON) the frequency scan stops at 50, 100 MHz and every further 100 MHz to avoid clicks. The receiver is muted for a fractional second.

(28) Preset Potentiometer for ZERO setting of LOG meter display. Set i.-f.switch to highest attenuation (20 dB on switch 20) and remove input signal. Set to the "N" or "M" on the meter scale (=null, zero).
(25) is the dc amplification control to set the meter to the mid scale 0 dB with the key (18) pressed (100-Hz Pulse Calibration). Press continuously and set (25) until the meter pointer is on the center scale 0 dB reference mark. After warm-up, repeat both checks for best LOG display (also on the XY Recorder).